

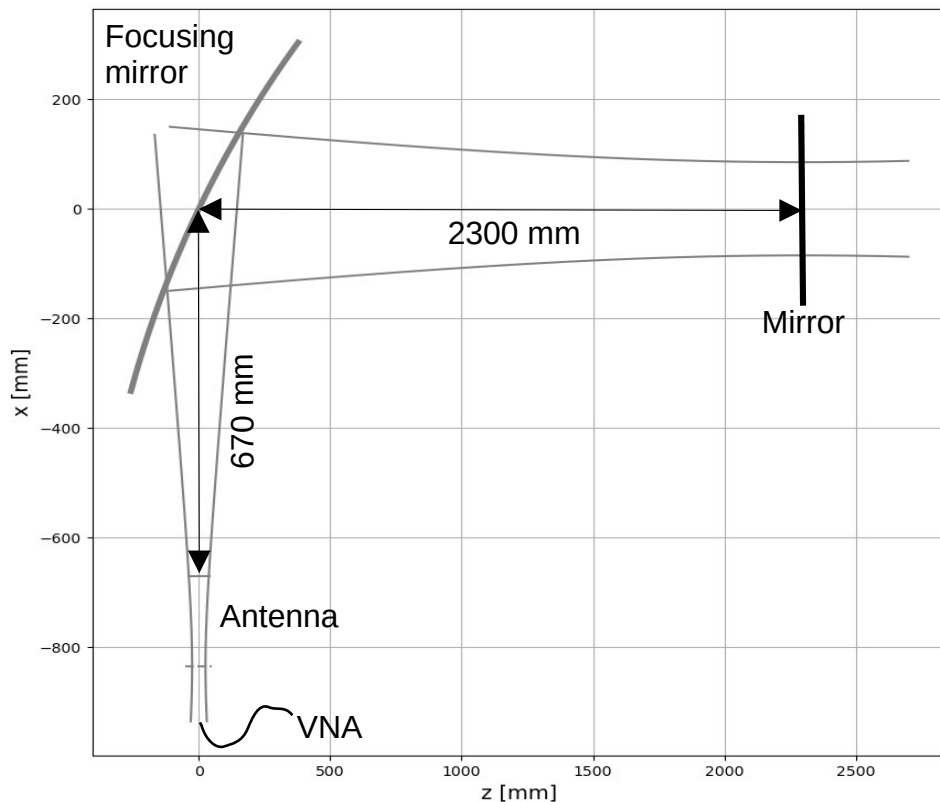


RF alignment in MC

MADMAX Summer Collaboration Meeting

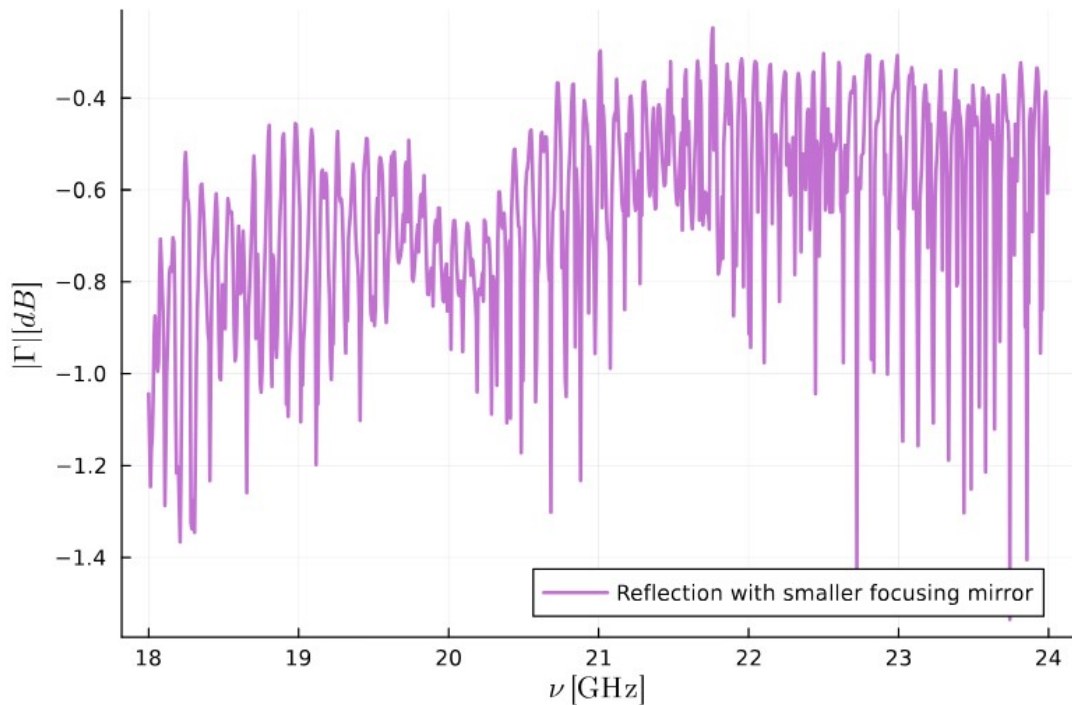
Target setup

- Align the setup to measure a signal with the antenna
- Use alignment method that also works inside the cryostat
- The mirror is positioned outside (only need to align focusing mirror and antenna)



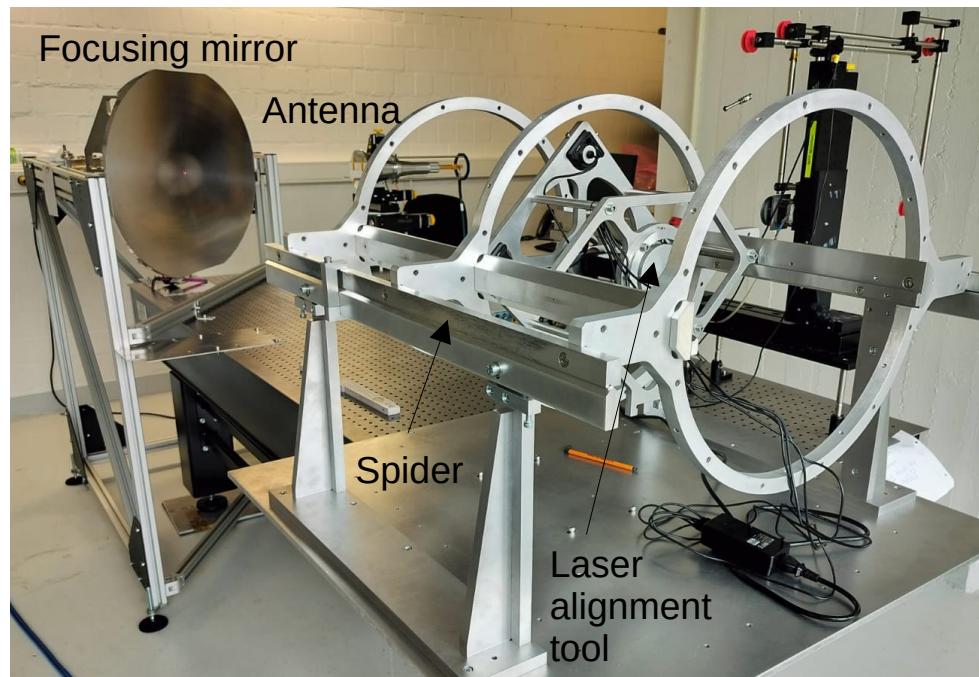
Alignment goal

- Maximize the back reflected signal
- Minimize resonance dips
- Reflectivity is measured in
$$dB = 10 \cdot \log_{10} \left(\frac{P_{backreflected}}{P_{in}} \right)$$
- Goal: back reflected signal between -0.5 dB and -2 dB
(to account for larger losses because of the bigger distance compared to old setup)



Laser alignment

- Laser alignment tool inside spider
- Central (red) laser for absolute distance measurement
- 4 additional lasers for the focal point determination



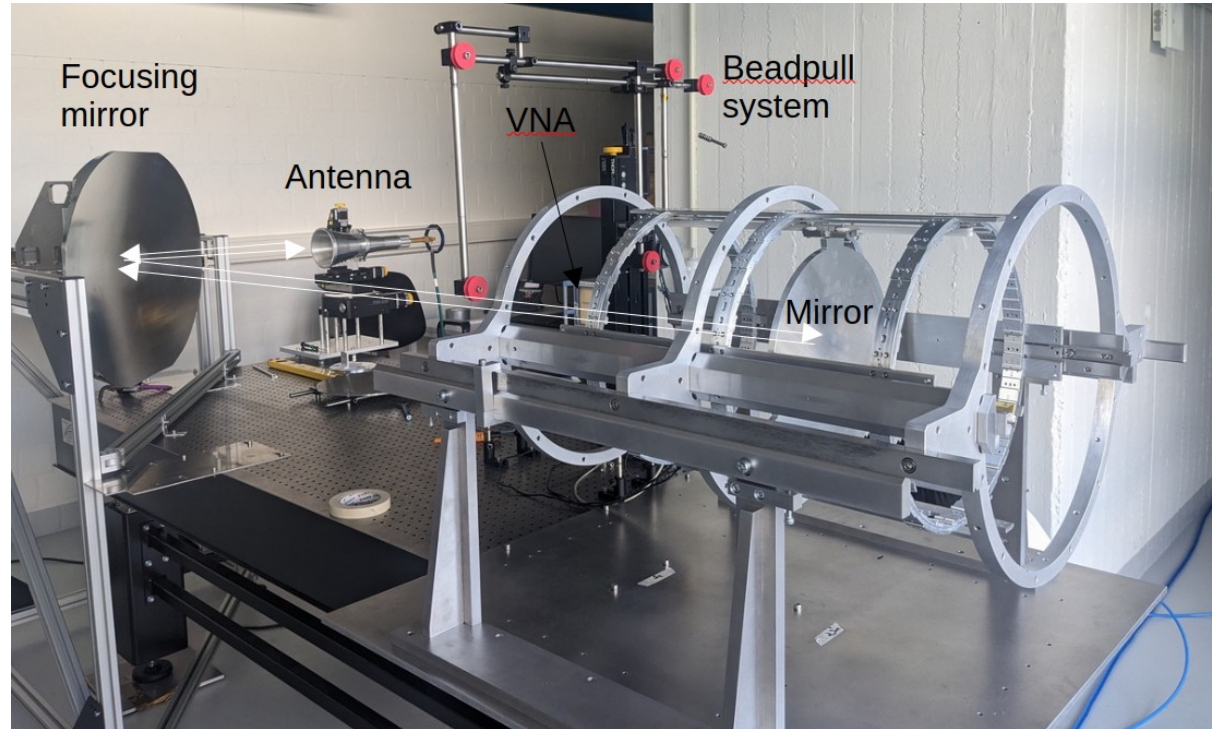
Alignment spider to focusing mirror (FM)

- Check if distance spider to FM is 2300 mm
- FM center is marked with a hole
- Match middle laser point to center of FM



Setup for reflection measurements

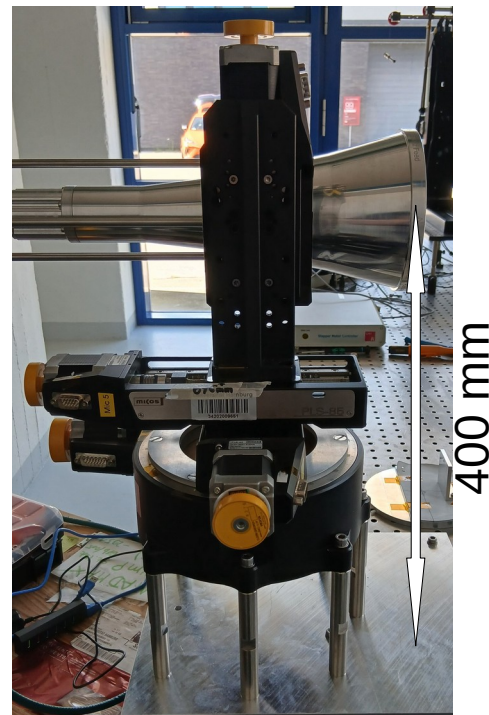
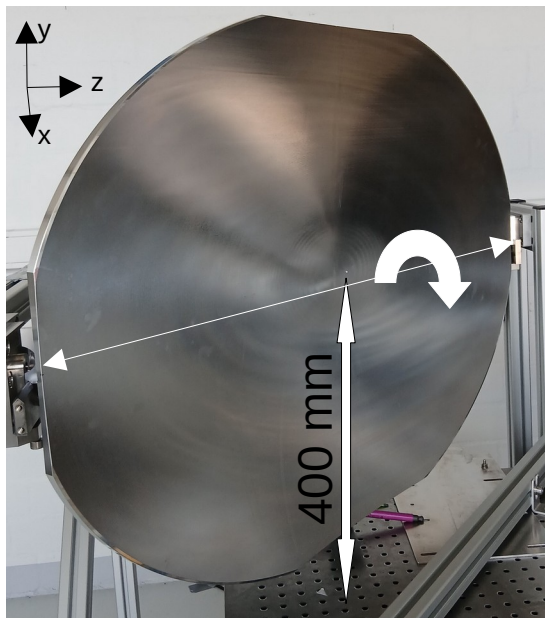
- Distances:
 - Antenna to focusing mirror: 670 mm
 - Focusing mirror to mirror: 2300 mm



RF alignment y direction

Alignment steps:

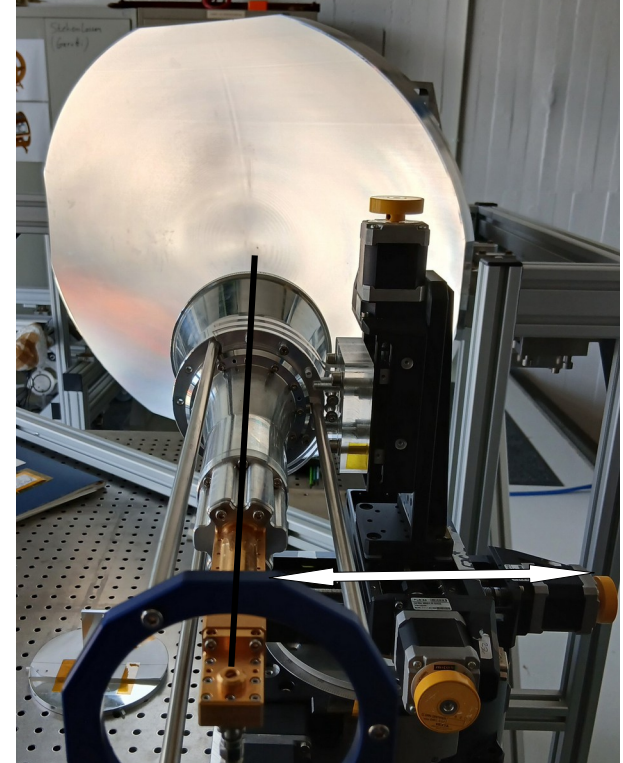
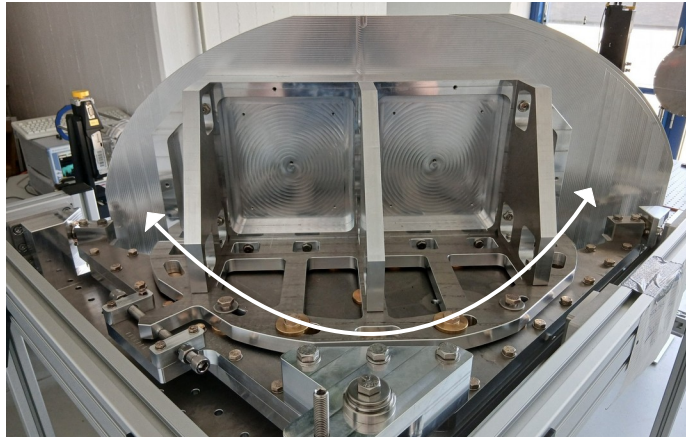
1. Align height of FM and antenna
(on optical table it is 400 mm)
2. Adjust angle of FM (45° to x- and z- axis) and correct antenna height iteratively



RF alignment x direction

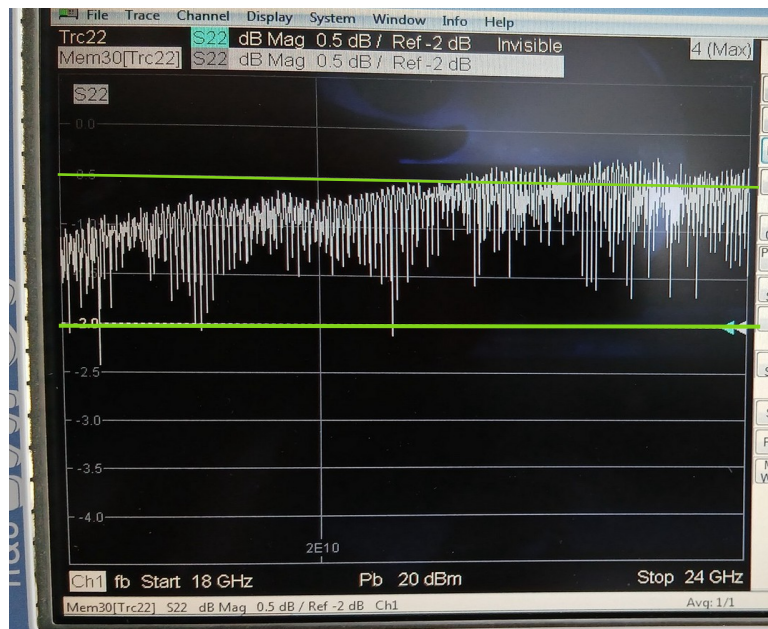
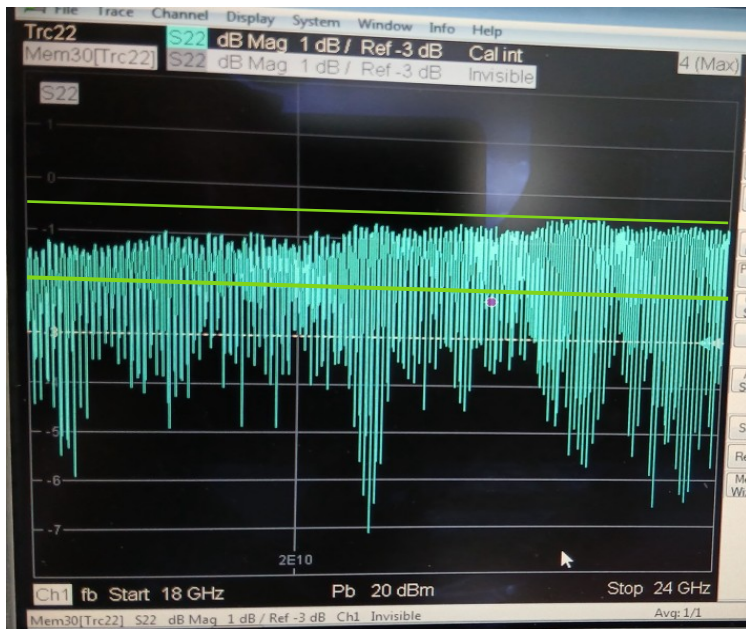
Alignment steps:

- 1) Adjustment of antenna in x direction by eye
- 2) Adjust x-angle of FM and correct antenna position iteratively



RF alignment

- Back reflected signal between -0.5 dB and -2 dB after alignment

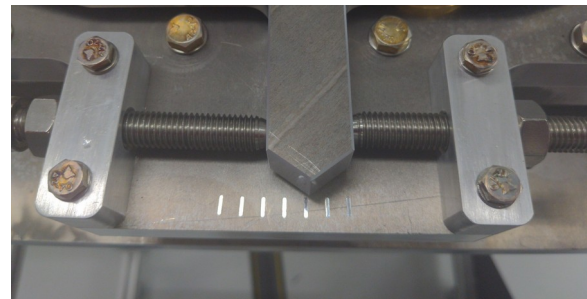


Summary & Outlook

- Use lasers to
 - align spider center to FM center
 - Measure distances from mirror to FM and to Antenna
- Align y-axis first
- Maximize the RF signal while changing x-positions and -angles



Laser alignment



RF alignment